"A Support Device for Containers in Extracorporeal Blood Treatment Machines"

Background of the Invention.

The invention relates to a support device for containers, for extracorporeal blood treatment machines, or for renal failure treatment machines.

In more detail, the support device is destined to hold in position a predetermined number of bags containing the appropriate liquids destined for the various therapies which the patient will undergo.

As is known, the market already offers various machines for extracorporeal blood treatment, or for treatment of renal insufficiency, which machines are provided with respective support devices associated to the machine.

A first type of these support devices is constituted by arms, for example metal arms, which are engaged to the structure, directly constrained to the machine at an upper portion of the machine and provided at ends of the arms with one or more hooks which the bags containing the treatment liquids are attached to.

Another type of intensive therapy machine has these support devices located at a lower portion of the machine, so that the bags are attached in a position which is below the body of the machine.

Obviously, the second above type of machine has an improved stability with regard to the first, especially concerning jogs and sharp impacts in general to the machine in use, as the whole device's centre of gravity is kept as close as possible to the ground.

Though the prior art contains various bag support devices for machines destined for renal failure treatment or extracorporeal blood treatment, these devices have proved to be susceptible to improvement of various natures.

First of all, it is to be noted that the machines provided with support devices located above the machines themselves can lead not only to the above-mentioned problems connected with unexpected impacts and displacements, but also create problems related to the sometimes laborious and problematic operations of machine loading, i.e. the necessary lifting of a plurality of bags into the high position, and the need to make sure they are correctly engaged to the supports.

On the other hand, machines with the support devices located in the lower portion of the machine body require, for reasons of stability, that the bags be positioned as close as possible to the vertical axis of the machine in order not to laterally displace the machine centre of gravity.

The above requirement leads to the need to position the containers below the machine body, in a zone which is difficult to access both visually and manually.

Summary of the Invention.

In this situation, the main aim of the present invention is to resolve the above-described drawback in the prior art.

A first aim of the invention is to maintain optimum stability of the machine in the face of impacts and displacements, both when the machine is not loaded with bags containing liquids and after the bags have been loaded.

A further aim of the invention is to provide a support device which enables easy bag-positioning operations, therefore ensuring, when the machine is being loaded, a simpler visual and manual access thereto.

Finally, a further aim of the invention is to limit the machine weight and dimensions as much as possible.

These and other aims will better emerge in the description that follows, of a support device for bags, for extracorporeal blood treatment machines or for renal failure treatment machines, according to what is set out in the appended claims.

Brief Description of the Drawings.

Further characteristics and advantages of the invention will better emerge from the following detailed description of a specific embodiment, here described by way of non-limiting example with reference to the figures of the drawings, in which:

- figure 1 is a side view of a support device according to the invention, in a minimum extension configuration;
- figure 2 is the device of figure 1, in a maximum extraction configuration;
- figure 3 is a side view of the device of figure 1;
- figures 4 and 5 are views from above of the device of figures 1 and 2;
- figure 6 is a schematic and perspective view of a machine for intensive therapy provided with the support device of figure 1;
- figure 7 is the machine of figure 6 loaded with a plurality of containers.

Detailed Description.

With reference to the figures of the drawings, 1 denotes in its entirety a support device for containers or bags for machines for extracorporeal blood treatment or for renal insufficiency treatment.

As can be observed in figures 1 to 5, the bag support device 1 comprises a base body 2, which base body 2 is generally (though not necessarily) constrained rigidly to a lower zone of a machine 100.

Obviously the device can be mounted in other parts of the machine, even above the machine body.

Generally speaking, however, the base body 2 is located below the body of the machine to enable a subsequent housing of the various bags 10 destined for use in the blood treatment operations or renal failure treatment operations in a free space afforded below the machine to which the support device is associated (see in particular figure 7, in which however the base body 2 is not visible).

In other words the machine affords a housing space 28 between the machine body 27, an upright structure 26 extending away from a floor base 25 and the same base 25.

The support device will be housed in the housing space 28 engaged to the machine body 27 and the upright structure 26.

This particular configuration means that the axis of the centre of gravity of the whole machine is maintained within the structure of the rest base when the machine is loaded with bags or when it is free of bags, whether the device is closed in the retracted position or open in the extracted position.

As well as the base body 2, the device also comprises a support element 3 associated to the base body 2, which support element 3 can be moved with respect to the base body 2 between at least an operative loading position (figures 2, 5 and 6) and an operative work position (figures 1, 4 and 7).

In other words, the support element 3 is slidingly mobile between the operative loading position, corresponding to an essentially maximum extraction position of the support element 3 from the base body 2, and the operative work position, corresponding to an essentially minimum extraction position of the support element 3 in relation to the base body 2.

In the illustrated embodiment, the support element 3 moves between the above-cited positions along a movement direction 4 lying in an essentially horizontal plane.

The support device for containers passes from one to the other position by translating movements.

A possible further embodiment could be inserting a hinge between the base body 2 and the support element 3 so that the displacement between the operative loading position and the operative work position could follow a rotary displacement or a combination of rotary and translating movements.

From a structural point of view the support element 3 exhibits at least one and, in the illustrated embodiment, two elongate arms 5, 7 which are slidable in respective guides 6, 8 of the base body 2, defining a telescopic structure.

Also, should a longer extraction run be necessary, it would be possible to include a telescopic structure having

more than one telescopic guide, for example, one telescoping guide into another.

The support element 3 is provided with suitable means 9 for supporting a container 10.

The means 9 for supporting can be constituted by at least one body 11 which is removably constrainable to the support element 3.

The body 11 will be equipped with at least one support hook 14, and usually with at least two and specifically three support hooks 14, destined to receive respective containers 10.

The body 11 will also be provided with an organ for manual transport 12, for example a handle 13.

As the body 11 is removably constrainable to the support element 3, it can be separated there-from, a bag can be engaged on the respective hooks 14 and by means of the handle 13 the bag can be easily constrained to the support device by resting a rod 15 of the body 11 on special supports 16 exhibited by the support element and clearly visible in figures 2 and 3.

The support element 3 is further equipped with a manoeuvring handle 23 for enabling manual displacement between the operative work position and the operative loading position, and vice versa.

Obviously, instead of or together with the manoeuvring handle 23, an automatic movement system could be installed, in which the support element 3 could be commanded to displace between the various operative positions.

As can be observed in the figures, the support element 3 is provided with at least one mechanical endrun stop 17 for the operative loading position.

The endrun stop 17 can be a groove, for example located on the elongate arm 5 (see especially figure 1).

The support element 3 will also have at least one further endrun stop 18 for the operative work position.

In this case too, the mechanical endrun stop 18 can be a groove, for example, located on the elongate arm 7 (see especially figure 2).

The support device for bags further comprises at least one position sensor 19 associated to the base body 2 and able to recognise at least the arrival of the support element 3 in the operative work position.

The sensor will, usually, be a Hall sensor of known type and not further described herein.

Obviously, with the position sensor 19 it will be possible, should the need arise, to detect any position of the support element 3 relative to the base body 2.

The base body 2 is provided with weight sensors 20 for calculating the weight of a container 10 associated to the support device.

In particular, the sensors 20, for determining the weight, comprise at least one balance 21, which will send a signal proportional to the detected weight of the bag to a control unit. A further, controlling, balance 22 could be included to supply a further signal proportional to the weight of the bag, in effect controlling the reading of the other balance 21.

The device further comprises stop means 24 for selectively blocking the relative position of the support element 3 with respect to the base body 2 at least in the operative loading position and/or in the operative work position.

The stop means 24 can be constituted by a simple manually-activated or automatic pawl which cooperates with the elongate arms 5, 7 to block the arms in the desired relative positions.

Alternatively an actuator organ coordinated by a CPU can be included, to block at least one of the elongate arms 5, 7 on reaching a desired position.

The stop means 24 are normally active in blocking the support element in a retracted position, so as to prevent an undesired extraction of the arms 5, 7 when the machine is moved.

The stop means 24 are controlled, for example by an analog or digital control device, to enable contemporary extraction of a predetermined number of arms and bags. For example, if the predetermined number is one, the stop means 24 enable extraction of a single support at a time, automatically blocking the other supports in the retracted position. When the extracted support is returned to the retracted position the stop means 24 enable another or the same support to be extracted once more.

When the machine is unloaded, and loading of containers is about to begin, the support element is extracted, moving from the minimum extraction position from the base body 2 into the operative loading position (i.e. the maximum extraction position).

At this point the means 9 for supporting a container are brought into use, which are removed from the support

element so that a bag can be engaged on the relative hooks.

Using the handle 13 the bag is positioned on the support element in a correct position and then the support element 3 is brought back into the operative work position.

The device may be designed so that the loading of a container 10 can be carried out exclusively in the operative loading position of the support element 3, in order to avoid the possibility of incorrect assembly operations.

The signal coming from the balance 21 will be sent and read as correct only when the container and the support element 3 are in the operative work position.

The invention offers important advantages.

Firstly, the use of a support device having a telescopic structure affords a very easy and functional loading operation of the bags for dialysis treatment and/or blood treatment on the patient.

In particular, as the support element 3 can be extracted, visual and manual access becomes extremely easy, and being in the lower position access for the operator is extremely comfortable.

Once the support arm is brought into the operative work position the added weight due to the presence of the bags is located as closely as possible to the ground and to machine centre of gravity.

Thus stability in the face of jogs, impacts and sharp movements is optimised; and the space taken up by the whole machine is diminished.

All of the various activities of the machine, controlled by a control unit, are started up only when the bag is correctly positioned below the machine, preventing erroneous activation on the part of the operator or activation of the machine when working conditions are not optimal.